THE MINERAL INDUSTRY OF ZAMBIA

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Zambia is a landlocked southern African country with an area of 752,614 square kilometers. In 2004, Zambia had an estimated population of 10.5 million. The mining sector was dominated by copper and cobalt production and the country was a leading producer of cobalt, copper, and gem-quality emerald. Coal, a variety of mineral commodities for the construction industry, other gemstones (primarily amethyst, beryl, and tourmaline), sulfur, and refined petroleum products also were produced in Zambia (World Bank Group, 2005§[1]).

In 2004, Zambia's real gross domestic product (GDP) grew by 5.0% and inflation declined to 18% from 21.5% in 2003. The GDP based on purchasing power parity was estimated to be $9.85 billion, and the GDP per capita based on purchasing power parity was estimated to be $870 (International Monetary Fund, 2005§).

Government Policies and Programs

Mining operations were regulated by the Mines and Minerals Act (No. 31) of September 13, 1995. The Government encouraged private development and diversification of the mining sector and promoted small-scale mining, especially of gemstones. The Environmental Protection and Pollution Control Act (No. 12) of 1990 and the Mines and Minerals (Environmental) Regulations of 1997 also regulated mining operations.

Most of the mining assets of the Government-controlled Zambia Consolidated Copper Mines Ltd. (ZCCM) had been divested by 2000; when a few privatization efforts failed, however, the operations were reoffered for new privatization bids. ZCCM subsequently was reorganized as ZCCM Investment Holdings Plc (ZCCM-IH), which retained a minority interest in the privatized mines. In 2004, the Government continued efforts to privatize coal, limestone, gemstones, and other small-scale mining operations and to attract foreign investors to develop known industrial and metallic mineral resources.

Exports of scrap metal were banned in September 2004. The Government initiated the ban to encourage the local iron foundry industry and to reduce the vandalization of copper wire from the electricity and telephone companies (Zambia Daily Mail, undated§).

Commodity Review

Metals

Cobalt and Copper.—The country's leading copper company, Konkola Copper Mines Plc (KCM), was again privatized in November 2004 when Vedanta Resources plc, which was an Indian-managed company registered in the United Kingdom, acquired 51% interest in KCM. Zambia Copper Investments Ltd. (ZCI) retained 28.4% interest in KCM, the state-owned ZCCM-IH retained 20.6% interest, and the Government held a "Golden Share," which allowed it to intervene when the company's actions were perceived not to be in the interest of Zambia. As part of the purchase, Vedanta obtained an option to purchase ZCI's interest in KCM. KCM operated underground copper mines at Konkola and Nchanga, an open pit copper mine at Nchanga, an underground pyrite mine at Nampundwe, a solvent extraction-electrowinning (SX-EW) plant at Nchanga, and a copper smelter and refinery at Nkana (Vedanta Resources plc, 2005, p. 5; Zambia Copper Investments Ltd., 2005, p. 4, 7; Zambia Privatisation Agency, undated§).

First Quantum Minerals Ltd. of Canada operated the Bwana Mkubwa SX-EW plant near Ndola to process ore from its Lonshi Mine, which is located 36 kilometers (km) across the border in the Democratic Republic of the Congo [Congo (Kinshasa)]. During 2004, First Quantum transported about 669,000 metric tons (t) of ore that contained an average of 5.5% copper from Lonshi to the Bwana Mkubwa plant. The plant produced 41,546 t of refined cathode copper in 2004 compared with 29,513 t in 2003. This increased production accounted for about 57% of the total increase in the country's electrowon copper output in 2004. The Bwana Mkubwa operation also produced 140,200 t of sulfuric acid; the surplus (66,460 t) was sold to other Copperbelt operators. First Quantum also continued development of the Kansanshi copper mine near Solwezi; production was expected to begin in 2005 (First Quantum Minerals Ltd., 2005, p. 19-21).

In 2004, Luanshya Copper Mines Plc (LCM) [a subsidiary of the J&W Investment Group of Switzerland (85% interest) and ZCCM-IH (15%)] produced about 20,000 t of copper in concentrate at the Baluba Mine; the concentrate was processed by the cobalt-processing company Chambishi Metals plc, which was also a subsidiary of the J&W Investment Group (90% interest) and ZCCM-IH (10%). In 2003, LCM had acquired the Baluba and the Luanshya Mines and the undeveloped Muliashi North deposit. LCM did not expect to reopen the Luanshya Mine, which was operated from the 1930s until it was closed in 2001 after being flooded. In 2004, Chambishi Metals, which also processed material from the Nkana slag dumps, recovered 4,500 t of cobalt in addition to copper (Tassell, 2004a; Times of Zambia, 2005§).

In 2005, Metorex Ltd. of South Africa expected to close the Chibulma West Mine where the economic reserves were nearly exhausted. Metorex also continued work on the decline at the Chibulma South Mine. Ground conditions pushed the planned opening of the underground Chibulma South Mine into 2005 (Metorex Ltd., 2005, p. 17).

[1]References that include a section mark (§) are found in the Internet References Cited section.

Mopani Copper Mines plc, which was the second-ranked copper-cobalt producer in Zambia, was owned by Glencore International AG (73.1% interest), First Quantum Minerals Ltd. (16.9%), and ZCCM-IH (10%). In 2004, Mopani produced about 160,000 t of copper and about 2,000 t of cobalt from the Mufulira Mine, smelter, and copper refinery and the Nkana Mine and cobalt refinery (First Quantum Minerals Ltd., 2005, p. 25).

Mopani had several projects underway to rehabilitate and expand production capabilities. At the Mufulira Mine, Mopani continued the project to deepen the mine to 1,640 meters (m) from 1,340 m and proposed to use 55-t dump trucks in the mine. Mopani also started an in situ leach of the pillars and the stopes that had been back-filled with tailings in the upper levels of the mine and began construction of an 18,000-metric-ton-per-year (t/yr)-capacity SX-EW plant. Work continued on the proposed replacement of the Mufulira smelter's 30-year-old 450,000-t/yr-capacity electric arc furnace with an ISASMELT furnace, which was designed to process 650,000 t/yr of concentrate. At Nkana, work included the expansion of one of the four shafts at the mine, which was to handle the development of two additional levels in the Synclinorium area, and a new heap-leach and solvent-extraction operation of the Mindola North open pit copper mine (Tassell, 2004b; Musunka, 2005§).

NFC Africa Mining Plc. [a subsidiary of China Nonferrous Metal Industry Foreign Engineering and Construction Co., Ltd. (85% interest) and ZCCM-IH (15%)] ramped up production from the Chambishi underground mine and mill. The Chambishi operation produced 49,054 t of copper concentrates in 2004 (Minerals Engineering International, 2005§).

In 2004, the Government awarded the Lumwana Joint Venture of Equinox Resources Ltd. of Australia (51% equity interest) and Phelps Dodge Corp. of the United States (49%) a 25-year Large Scale Mining License for cobalt, copper, gold, and silver. The joint venture continued exploration of the Lumwana Copper Project, which is located 220 km northwest of the main Zambian Copperbelt in northwestern Zambia. Equinox, which continued negotiations to acquire a full 100% ownership in the project, proposed to start the development of the Lumwana prospect in 2005 and to begin production during the second half of 2006 (Equinox Resources Ltd., 2005).

Other exploration in Zambia included the recovery and testing of a mini-bulk sample by Caledonia Mining Corp. of Canada on its Nama cobalt-copper project. Caledonia proposed to build a pilot plant in 2005 to produce a cobalt concentrate for smelter testing. African Eagle Resources plc of the United Kingdom drilled the Eagle Eye and the Mwezi iron oxide copper gold prospects of its Sasare License, which is located near the Mozambique border in eastern Zambia. Billiton Development Ltd. of Zambia (a subsidiary of BHP Billiton Ltd.) completed a geophysical survey on the Mumbwa copper-gold prospect for its joint venture with AIM Resources Ltd. of Australia. Zambezi Resources Ltd., which was an Australian-managed company registered in Bermuda, continued prospecting and sampling of its copper, gold, and nickel projects in Zambia.

Gold.—Luiri Gold Exploration Co. explored its gold licenses that included the former Dunrobin Mine, which closed in 2000, and the Matala Mine, which closed in 1941.

Nickel.—Albidon Ltd. of Australia completed an airborne geophysical survey of the adjacent Kabeswa and Munali licenses and continued drilling its Munali nickel prospect. In October, Albidon entered into a joint venture with WMC Resources Exploration Pty. Ltd. of Australia (a subsidiary of WMC Resources Ltd.), which subsequently funded a soil sampling program on the Zimba nickel prospect.

Industrial Minerals

Diamond and Gemstones.—Redevelopment of Zambia's gemstone industry by the private sector was a goal of the Mining Sector Diversification Programme, which was a 5-year Ministry of Mines and Mineral Development project that had begun in 2002 and was financially supported by the European Development Fund. Aquamarine and tourmaline were recovered in the Lundazi pegmatite area of eastern Zambia. Tourmaline was also mined at the Jagoda Mine of Jagoda Gems Ltd. and at the Kumanga Mine of Gemstone Marketing & Consultancy Ltd. in the Mkushi area in central Zambia.

In northwestern Zambia near the Angolan border, the joint venture of Motapa Diamonds Inc. (60%) (an affiliate of BHP-Billiton World Exploration Inc.) and Caledonia Mining (40%) completed a 5,000-line-kilometer airborne gravity and magnetic survey over the Mulonga Plain diamond license. The joint venture also completed sampling programs on the Kashiji Plain and the Lukulu diamond licenses.

Emerald mining was concentrated in the Ndola Rural Protected Area, which is located about 40 km west of Kitwe. In addition to the mechanized operations that included the Chantete Mine of Samico Mining Co. Ltd.; the Grizzly Mine of Grizzly Mining Zambia Ltd.; the Kagem licenses of Kagem Mining Ltd.; the Kamakanga Mine of Kuber Minerals & Metal Mining Co. Ltd.; the open pit and underground operations of Mitondo Mining Co. Ltd.; the Pirala and the Twampane Mines of Sorti Mining Ltd.; and the operations of Sarunit Enterprises Ltd, other emerald mining interests included numerous small-scale operations and under-funded inactive license holders. In June, the Government announced a $218,400[2] program for the support of gemstone mining (Kalero, 2004§).

Lime and Limestone.—In 2004, the Zambia Privatisation Agency and Athi River Mining Ltd. of Kenya began negotiations on the privatization of Ndola Lime Company Ltd., which was Zambia's sole producer of limestone and lime. Negotiations continued at yearend.

[2]Where necessary, values have been converted from Zambian kwacha (ZmK) to U.S. dollars (US$) at the average rate of ZmK4,758=US$1.00 for 2004.

Infrastructure

As a landlocked country, Zambia was dependent on truck and rail transport to sustain most of its economy. The truck road and railway networks within the country and externally were reasonably adequate for access to ocean and lake ports for international trade. The principal rail routes from Ndola ran nearly 2,000 km northeast to the Port of Dar es Salaam, Tanzania, and south through Zimbabwe. From Zimbabwe, rail traffic could be diverted to the Port of Beira, Mozambique, which is located roughly 2,000 km from Ndola, or to South African ports, which are located more than 2,500 km from Ndola. The more than 2,200-km rail line that ran north into Congo (Kinshasa) and west to the Port of Benguela (Lobito), Angola, remained closed. Major highways generally paralleled the rail lines.

The crude oil pipeline that ran about 1,700 km from Dar es Salaam to the Ideni refinery in Ndola was owned and operated by Tazama Pipelines Ltd., which was a joint venture of the Tanzanian and the Zambian Governments. The pipeline was capable of transporting about 22,000 barrels per day of crude petroleum.

Zambia had no domestic resources of oil and gas and was dependent primarily on hydroelectric power for most of the country's power needs, although there was some coal-fueled electricity power generation.

Outlook

Despite setbacks caused by the general decline in international cobalt and copper prices from 1995 to 2002, Zambia's program to privatize the cobalt and copper mining sector has been generally successful in attracting significant new investment to revitalize the formerly declining industry. The country faced several internal and external hurdles to development, which included cyclical world commodity prices; high transportation costs; limited national infrastructure, particularly west of the Copperbelt; and the threat that high HIV/AIDS rates in the region posed on maintaining a skilled labor force. On the positive side, the apparent end of the civil wars in neighboring Angola and Congo (Kinshasa) is expected to help reduce the political risk of financing new projects. Restructuring of the gemstone sector and efforts to manage the export flow of gemstones more effectively also have the potential to generate a larger value-added industry in Zambia.

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TABLE 1
ZAMBIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2000	2001	2002	2003	2004[e]
METALS						
Cobalt:						
Mine output, Co content		4,600	8,000 [e]	10,000 [e]	11,300	13,000
Metal, Co content		3,342	4,657	6,144	6,550	7,800
Copper:[2]						
Mine output, Cu content:						
By concentration or cementation		184,100	233,000	258,000 [r]	269,000 [r]	344,300 [3]
Leaching, electrowon		65,000	79,000	83,000 [r]	79,000 [r]	82,600 [3]
Total		249,100	312,000	341,000 [r]	348,000 [r]	426,900 [3]
Metal:						
Smelter, primary:						
Electrowon, low grade		25,000	25,100	NA	NA	NA
Other		180,000	215,000	NA	NA	NA
Total		205,000	240,100	253,500	268,000	280,100 [3]
Refinery, primary:						
Electrowon		65,000	79,000	83,700	99,800	120,900 [3]
Other		162,400	217,000	253,100	250,000	277,300 [3]
Total		227,400	296,000	336,800	349,800	398,200 [3]
Gold	kilograms	600 [e]	--	--	--	--
Selenium, refined, gross weight	do.	9,370 [e]	--	--	--	--
Silver	do.	4,710 [e]	--	--	--	--
INDUSTRIAL MINERALS						
Cement		380,000	215,470	230,379	480,000	525,000
Clays:[e]						
Brick		3,000	3,000	3,000	3,000	3,300
Building, not further specified		30,000	30,000	30,000	30,000	33,000
China and ball		200	200	200	200	200
Gemstones:[e]						
Amethyst	kilograms	800,000	1,145,029 [3]	1,064,606 [3]	1,000,000	1,100,000
Beryl	do.	4,000	1,567 [3]	8,551 [3]	8,000	8,000
Emerald	do.	7,000	764 [3]	1,860 [3]	2,000	2,100
Garnet	do.	3,000	NA [3]	NA [3]	NA	NA
Tourmaline	do.	2,000	25,619 [3]	25,755 [3]	25,000	26,000
Gypsum[e]		11,000	--	--	--	--
Lime, calcined	thousand metric tons	142	117	151	145 [e]	150
Limestone, for cement and lime	do.	177	61	330	690 [r, e]	750
Limestone, crushed aggregate	do.	437	450	450	600 [e]	650
Sand and gravel, construction[e]	do.	200	200	200	200	220
Sulfur:						
Gross weight:						
Pyrite concentrate		50,000	199,400	225,870	226,000	280,000
Sulfuric acid[4]		110,000	63,000	10,000 [e]	10,000	12,000
Sulfur content:						
Pyrite concentrate (42% S)		21,000	83,752 [3]	94,900 [e]	95,000 [e]	118,000
Sulfuric acid (32.6% S)		35,800	20,500	3,260 [r, e]	3,300 [r, e]	3,900
Total, S content		56,800	102,252	98,200 [r, e]	98,300 [r, e]	122,000
MINERAL FUELS AND RELATED MATERIALS						
Coal, bituminous		168,000	104,600 [3]	71,700	71,800	240,000
Petroleum, refinery products[e]	thousand 42-gallon barrels	--	--	--	5,000	6,200

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r]Revised. NA Not available. -- Zero.

[1]Table includes data available through November 18, 2005.

[2]Terms used are as defined by the International Copper Study Group.

[3]Reported figure.

[4]From the Chambishi and the Nkana acid recovery plants.

Sources: Zambia Government data and company reports. Data estimated by the U.S. Geological Survey.